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STUDY EFFECT OF SPROUTING SEEDS AND PLANTING DATES ON GROWTH AND YIELD OF TARO PLANT (*Colocasia esculenta, L.*) AT NORTH DELTA REGION

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ABSTRACT

Two field experiments were carried out during the two successive growing seasons of 2003 and 2004 on taro (local var.) at EL-Zahraa; Mansoura; Dakahlia Governorate, Egypt (as a quite representation of north delta region).

The main objective of this investigation was for study the effect of using pre-sprouted taro corm seeds in plantation (new method) instead of the un-sprouted ones which are still used (conventional method), as well as the effect of planting date on the vegetative growth,total yield and its components of taro plant.

The results indicated that the percentage of plants emergence, plant height, leaf area, fresh and dry weight of arial parts of plant, weight of corms/plant, average of corm weight and total yield/feddan significantly increased by using pre-sprouted corm seeds as compared with the un-sprouted ones , the average increment in the total yield / feddan reached (18.05 – 20.17 %) during the two study seasons .On the other hand , dry matter, starch, protein, N, P, K, Ca, Mg and total oxalate contents in corm were not affected by sprouting process.

Concerning planting dates, results showed that the planting on (15^{h} March) increased significantly the vegetative growth parameters and the total yield/feddan, while, planting on (15th April) significantly increased percentage of plants emergence and led to an increase in corm constituents of dry matter, starch, protein, N, Ca, Mg and total oxalate. The planting on (1st April) significantly increased corms weight /plant, and the average weight of corm.

The interaction between sprouting methods of taro seeds and planting dates showed that using pre-sprouted seeds for planting on(15th March) increased the vegetative growth parameters and the total yield/ feddan under conditions of north delta region.

Finally,it could be concluded that success cultivation of taro plant through different planting dates in this region might be good indicator for prolonging taro production season in the near future in Egypt.

INTRODUCTION

Taro (Colocasia esculenta L., Schoot) is a wetland crop cultivated in many tropical and subtropical areas of the world. Taro-generally- is a neglected crop in Egypt, although, more than 400 million people in the world are still use taro in their diets (Steinke *et al..*, 1983). Taro plantation and the most favourable planting dates are still unknown in the different areas of Egypt specially in north delta region. Follett (1996) indicated that planting date of taro is limited by the soil temperature to mid-late spring and found that best growth occures at 25-35 °c for sprouting, also he found that earlier production can therefore be achieved by sprouting under cover or in a hot

house. The corms sprouting begin at 2 weeks and reached to 76-90% at 4 weeks after planting (Igbokwe *et al..*, 1984).

In Bangladesh, taro was planted –successfully- on the dates of 15 Mar.; 30 Mar.; 14 Apr. and 29 April (Ahammed *et al..*, 1988). In this connection, in Brazil, Almeida *et al..*, (1984) found that early May planting gave the highest yield and August planting gave the poorest yield of taro. In Egypt, Metwally (1996) indicated that planting of taro is done in spring months and the crop can grow during the worm summer months.

Taro plant growth was classified into 4 stages: primary growth stage; vigorous top-growth stage; corm bulking stage and corm maturity stage. Several researchers i.e. (Chan *et al..*, 1999; Wei *et al..*, 1999 and Hsiu, 2000) reported that the aboveground vegetative organs parameters were increased by high temperature during the growth stage. Susan *et al..*, (2003) planted taro in Hawaii island at 4 planting seasons (winter, spring, summer and fall), and found that vegetative growth and both of fresh and dry weight of corm were significantly greater for spring and summer plantings compared with fall and winter ones.

There was a clear relationship between the vegetative growth and yield, in this respect, Shih and Synder (1984) reported that yield and dry weight of corms increased linearly with leaf area increasing. Mohankumar *et al..*, (1990) and Chan *et al..*, (1997) illustrated that yield and corms dry matter were positively correlated with leaf area index and with mean of corm weight.

Planting date had no significant effect on the concentrations of nitrogen and protein, whereas, the maximum starch content in corm was at early planting dates (Metwally, 1996). El-Beheidi *et al..*, (2003) found that had no significant effects of planting dates on dry matter of arial parts and total yield of taro plant.

Bradbury and Holloway (1988) illustrated that the fresh corms of Tannia contain 20-30% starch and 1-4% protein.

Taro corms must be cooked before eating to remove calcium oxalate which cause irritation and acridity taste (Vinning, 1995 and Nip, 1997). Keates *et al..*, (2001) and Paiva and Machado (2005) suggests that biosynthesis of oxalic acid can be induced the presence of Ca^{++} accumulation of calcium oxalate in the plants.

The present study was carried out to show response of taro plants to different planting dates with two planting methods (new and traditional) and their effects on vegetative growth, yield, quality and some chemical parameters.

MATERIALS AND METHODS

This experiment was carried out at El-Zahraa village near Mansoura city, Dakahliya Governorate during the two successive summer seasons of 2003 and 2004. Local variety of taro (Colocadia esculenta , L. Schott.) was used for investigating the response of the plants to different planting dates and sprouting of taro seeds at north delta region. Some of physical and chemical properties of the experimental soil were as follows in Table (1).

Table (1): Physical and chemical characteristics of the experimental soil*

Physical properties			Chemical properties		
Character	Depth		Character	Depth	
	0-20 cm	20-40 cm		0-20 cm	20-40 cm
Sand %	33.8	35.0	Ec ds/m (1:5)	0.63	0.65
Silt %	24.9	23.2	Soluble onions	Meq/100 g soil	
Clay %	38.2	38.0	Co_3	0.0	0.0
Soil texture	Clay loam	Clay loam	HCo_3	2.05	2.0
O.M. %	2.5	2.4	Cl	0.3	0.32
$CaCo_3$ %	2.1	2.5	SO_4	0.8	0.93
T.S.S.	0.2	0.21	Soluble cations	Meq/100 g soil	
pH	7.8	7.9	Ca^{++}	2.15	2.18
Bulk density %	1.18	1.15	Mg^{++}	0.35	0.37
Field capacity %	44.2	42.9	Na^{+}	0.35	0.38
Available water %	23.15	22.54	K^{+}	0.20	0.32
Wilting point %	20.55	20.22	Available N ppm	29	25
			Available P ppm	16	14
			Available K ppm	414	382

* According to methods of Jackson (1973).

Experimental design was a split plots with three replicates.
The main plots were assigned to sprouting treatments as follows :
1- Seed pieces of corms sprouting pre-planting (as a new method).
2- Seed pieces of corms non-sprouting pre-planting (conventional method).
The planting dates were arranged randomly in the sub-plots as follows:
1- Planting on 15th February.
2- Planting on 1st March.
3- Planting on 15th March.
4- Planting on 1st April.
5- Planting on 15th April.

Every sub-plot represented by 4 raw, each with 5 m long, 0.8 m width and 0.4 m apart, the plot area was 16 m^2. Farmyard manure at rate of 80m^3 and calcium super phosphate at rate of 75 kg P_2O_5/fed. were added at two portions, the first portion during the soil preparation, while the second portion was added after four months from planting date. Nitrogen at rate of 220 kg N/fed. was splitted and added in five equal portions with interval of three weeks. Potassium at rate of 120 kg K_2O/fed. was added at two equal portions, the first portion was applied at completion of emergence, whereas the 2nd portion was added after 4 months from planting date. Other field practices were applied according to the recommendations of the Ministry of Agriculture.

Pre- sprouting method of taro seeds:

1- Three to four weeks before planting, taro corms were cutted into pieces, each one piece contains 2-3 buds, then the corm seed pieces were dusted with sulfur against rotting.
2- Seed pieces of taro were covered within layers of the sand. Every three days, the sand wet moderately until the buds of seed pieces well bloom and sprout.
3- After the buds sprouting, seed pieces were cleaned up from sand and then were left in dry, shade and well ventilated place until strong and green sprouts were obtained.

Date record:

A- Percentage of plant emergence at 20, 30, 40 DAP were calculated.

B- Growth parameters:

A random sample of four plants were taken from every experimental unit at 180 DAP to measure the following parameters:

1- Plant height (cm).
2- Leaf area (cm^2) was calculated according to Watson (1952).
3- Fresh weight (g) of arial plant parts.
4- Dry matter of arial plant parts (%).

C- Yield and its components:

1- Number of corms/plant at harvest.
2- Average of corm weight (g).
3- Total yield of corms/fed. (Ton).

D- Chemical analysis at harvest time in corm:

1- Dry matter and starch contents were determined according to (AOAC, 1980).
2- Nitrogen content was determined according to (Jackson, 1973).
3- Protein content (%) was calculated by multiplying (N x 6.25).
4-phosphour, calcium and magnesium were determined by using the methods of (Rangana, 1979).
5- Total oxalate was determined by the method of (Dye, 1956).

E- Statistical analysis:

The results were objected to statistical analysis of variance and the least significant differences (LSD) were calculated according to (Gomez and Gomez, 1984).

RESULTS AND DISCUSSIONS

Effect of seeds sprouting methods and planting dates on the percentage of plant emergence are presented in fig. (1-3),results indicated clearly superiority of pre-sprouted seeds at 20, 30 and 40 DAP as compared with the un-sprouted seeds.Percentage of plant emergence increased gradually by increasing temperature during the late planting dates.This superioity might be due to the short period equired for the pre-sprouted seeds to emerge as compared with the un-sprouted ones particularly under the high temperature prevailed during the late plantation on (15^{th} April) in both seasons.

As for the interaction effect between sprouting methods and planting dates, the percentage of emergence responded positively to pre-pre-sprouted seeds in planting date (15^{th} April) in both seasons. Similar conclusion were obtained by Igbokwe *et al.* (1984), Ahammed *et al.* (1988) and Follet (1996).

The effect of sprouting methods (new or conventional) on vegetative growth parameters at 180 DAP is shown in Table (2). Results revealed that using pre-sprouted taro seeds in cultivation caused a positive effect on the growth parameters i.e. plant height, leaf area, fresh weight and dry weight of arial parts in both seasons. This could be due to the earlier emergence of those plants produced by pre-sprouted seeds as compared with those by un-sprouted seeds.

Fig (1)

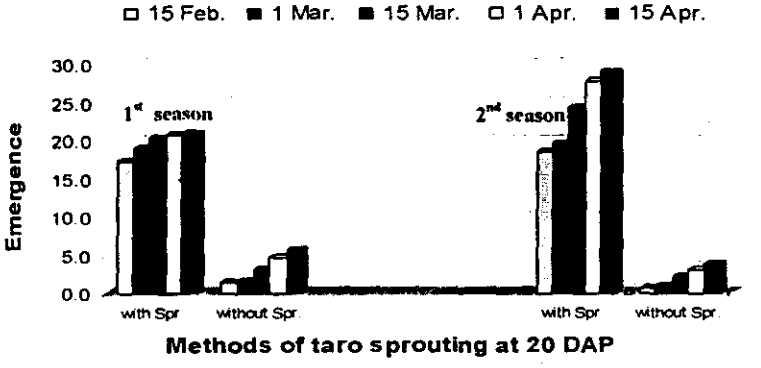

Fig (2)

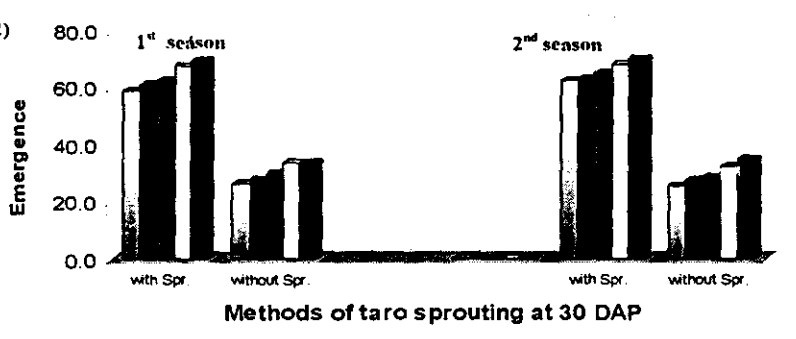

Fig (3)

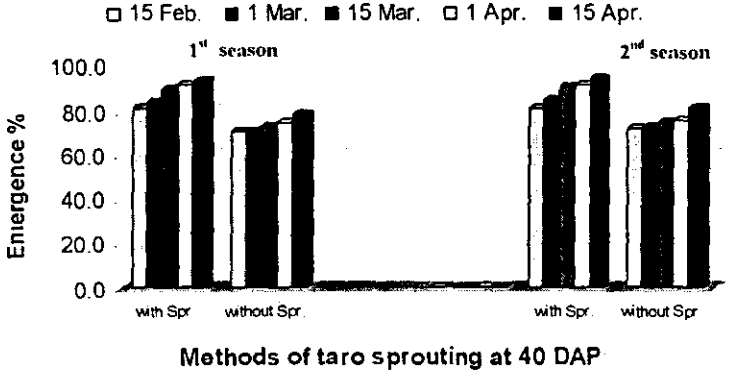

Fig (1, 2 & 3):Effect of sprouting methods and planting dates on percentage of plant emergence at 20, 30 and 40 DAP during the two growing seasons of 2003 and 2004.

Table 2: Effect of sprouting methods and planting dates on vegetative growth of Taro plant during 2003 and 2004 seasons at 180 DAP.

Characters / Treatments		Pant height (cm)		Leaf area (cm^2)		Fresh weight (g)		D.W. (%)	
		2003	2004	2003	2004	2003	2004	2003	2004
Pre-sprout .seeds (New method)		119.80	123.93	805.0	828.3	782.27	806.70	13.44	13.71
Un-sprout. seeds (Cconven. method)		89.33	95.60	673.5	690.3	649.87	667.07	13.21	13.46
F. Test		**	**	**	**	**	**	**	**
Dates									
15/2		95.50	102.50	701.0	734.2	678.67	709.33	13.20	13.53
1/3		100.67	105.17	724.8	740. 3	700.00	717.67	13.22	13.53
15/3		111.17	115.17	763.2	780.2	738.17	757.83	13.49	13.66
1 / 4		109.50	113.83	760.0	778.2	737.17	754.33	13.47	13.64
15/4		106.00	112.17	747.2	763.66	726.33	744.00	13.26	13.57
F. Test		**	**	**	**	**	**	**	**
LSD at 0.05		2.98	2.54	10.61	13.99	10.69	12.91	0.24	0.11
Interaction									
Pre-Sprouted seeds	15/2	109.00	118.00	747.3	798.0	725.33	773.33	13.20	13.57
	1/3	116.00	120.67	783.3	805.3	759.33	784.33	13.23	13.57
	15/3	127.00	129.00	839.7	856.3	813.33	833.67	13.78	13.90
	1 / 4	125.30	126.67	838.0	851.67	814.67	828.33	13.71	13.87
	15/4	121.70	125.33	816.7	830.0	798.67	811.33	13.29	13.63
Un - Sprouted seeds	15/2	82.00	87.00	654.7	670.3	632.00	645.33	13.20	13.50
	1/3	85.30	89.67	666.3	675.3	640.67	651.00	13.20	13.50
	15/3	95.30	101.33	686.7	704.0	663.00	682.00	13.20	13.43
	1 / 4	93.70	101.00	682.0	704.7	659.67	680.33	13.23	13.40
	15/4	90.30	99.00	677.7	697.3	654.00	676.67	13.23	13.50
F. Test		NS	NS	**	**	**	**	NS	NS
LSD at 0.05		--	--	15.00	9.55	15.12	12.60	--	--

Concerning the effect of planting dates on vegetative growth parameters, results in table (2) also revealed that the planting on (15^{th} March) gave a highest values of vegetative growth parameters as compared with the other planting dates. These results are in agreement with those obtained by Almeida *et al.* (1984), Ahammed *et al.* (1988) Metwally (1996); Chan *et al.* (1999); Wei *et al.* (1999); Hsiu (2000) and Susan *et al.* (2003).

Regarding the interaction between sprouting methods and planting dates, data in table (2) indicate that plant height and dry weight of arial parts were not significantly affected in both seasons, the highest significant values of leaf area and fresh weight of arial parts of the plant were obtained from plants grown on (15^{th} March) with pre-sprouted seeds.This was true in the two succssive growing seasons.Similar opinions were reported by Follet (1996), Chan *et al.* (1999); Wei *et al.* (1999), Hsiu (2000) and Susan *et al.* (2003).

Data presented in Table (3) indicated that the weight of corms/plant, average of corm weight and the total yield/feddan significantly increased by using pre-sprouted taro seeds in cultivation during both growing seasons as compared with those produced by un-sprouted seeds. Average increment

percentage in total yield/feddan by using pre-sprouted seeds reached (18.05 and 20.17%) of the two growing seasons 2003 and 2004, respectively in compared with using the un-sprouted seeds (conventional method).

Table 3: Effect of sprouting methods and planting dates on Taro yield and its components during 2003 and 2004 seasons.

Characters / Treatments		Weight of corms(kg/plant)		Average of corm weight (g)		Total yield (ton/fed)	
		2003	2004	2003	2004	2003	2004
Pre- sprout. seeds (New method)		1.512	1.642	641.87	757.53	15.351	16.026
Un-sprout. seeds (Conven. Method)		1.418	1.542	616.73	711.27	13.004	13.336
F. Test		**	**	**	**	**	**
Dates							
15/2		1.120	1.185	608.17	712.67	13.585	14.075
1/3		1.230	1.433	617.17	719.67	13.835	14.275
15/3		1.455	1.557	641.00	744.33	14.643	15.290
1 / 4		1.781	1.906	643.17	753.00	14.500	15.160
15/4		1.731	1.880	637.00	742.33	14325	14.675
F. Test		**	**	**	**	**	**
LSD at 0.05		0.044	0.027	10.15	7.00	0.29	0.23
Interaction							
Pre-sprouted seeds	15/2	1.130	1.210	618.00	734.33	14.720	15.400
	1/3	1.244	1.480	631.00	740.00	15.000	15.580
	15/3	1.532	1.650	657.33	776.00	15.906	16.780
	1 / 4	1.846	1.950	655.00	776.67	15.700	16.550
	15/4	1.808	1.920	648.00	760.67	15.430	15.820
Un-sprouted seeds	15/2	1.110	1.160	598.33	691.00	12.450	12.750
	1/3	1.216	1.486	603.33	699.33	12.670	12.970
	15/3	1.378	1.464	624.67	712.67	13.380	13.800
	1 / 4	1.716	1.862	631.33	729.33	13.300	13.770
	15/4	1.674	1.840	626.00	724.00	13.220	13.530
F. Test		*	*	**	**	**	**
LSD at 0.05		0.065	0.058	3.33	7.58	1.217	1.145

This increment might be due to the higher percentage of plant emergence by using the pre-sprouted seeds than the un-sprouted ones .

The effect of planting dates on taro yield and its components are presented , also in Table (3). Analysis of variance showed that the planting dates had significantly effects on weight of corms/plant, average of corm weight and total yield/feddan. Data of the two seasons indicated that the total yield/feddan significantly increased when taro seed were planted on (15th March), also, these results are clear reflection to the relationship between the vegetative growth specially leaf area of plant and yield parameters. These results are in harmony with those obtained by Shih and Synder (1984); Mohankumar *et al.* (1990) and Chan *et al.* (1997).

Regarding the interaction between sprouting methods and planting dates, data in Table (3) show that the maximum values of yield and its components were always recorded by planting on (15th March) with pre-sprouted seeds in both seasons.

Data in Tables (4, 5 and 6) show the effect of pre-sprouted seeds on corm contents i.e. dry matter, starch, protein, N, P, K, Ca, Mg and total oxalate at harvest time.

Table 4: Effect of sprouting methods and planting dates on Taro corm quality during 2003 and 2004 seasons.

Characters / Treatments		Dry matter (%)		Starch (%)		Protein (%)	
		2003	2004	2003	2004	2003	2004
Pre-sprouted seeds (New method)		61.30	61.20	26.21	26.59	7.644	7.619
Un-sprout. seeds (Conven. method)		59.94	60.41	26.25	26.55	7.447	7.430
F. Test		NS	NS	NS	NS	NS	NS
Dates							
15/2		59.62	60.10	24.38	24.73	7.235	7.256
1/3		59.68	60.18	24.58	24.88	7.305	7.362
15/3		59.98	60.58	25.80	26.02	7.475	7469
1 / 4		60.23	61.33	27.58	27.90	7.782	7.700
15/4		63.59	61.86	28.80	29.32	7.930	7.805
F. Test		**	**	**	**	*	*
LSD at 0.05		0.21	0.16	0.35	0.44	0.57	0.64
Interaction							
Pre-sprouted seeds	15/2	59.65	60.23	24.27	24.73	7.350	7.375
	1/3	59.72	60.28	24.53	24.93	7.410	7.475
	15/3	59.98	60.73	25.77	26.00	7.540	7.568
	1 / 4	60.23	61.87	27.63	27.93	7.940	7.750
	15/4	66.93	62.89	28.87	29.37	7.980	7.930
Un-sprouted seeds	15/2	59.58	59.97	24.50	24.73	7.120	7.137
	1/3	59.65	60.07	24.63	24.83	7.200	7.250
	15/3	59.97	60.42	25.83	26.03	7.410	7.432
	1 / 4	60.23	60.80	27.53	27.87	7.624	7.650
	15/4	60.25	60.82	28.73	29.27	7.880	7.680
F. Test		*	*	*	*	*	*
LSD at 0.05		0.65	0.34	0.56	0.82	0.37	0.26

The results indicated that there were no significant effects on the previous parameters by using pre-sprouted seeds during both seasons of 2003 and 2004 . With respect to the effect of planting dates on corm quality and its chemical contents, data in Tables (4, 5 and 6) also showed that there was no significant effect on the corm contents of phosphour and potassium in both seasons.

The higher contents of dry matter, starch, protein, nitrogen, calcium, magnesium and total oxalate in taro corm were recorded at the planting date of (15th April) , this superiority might be due to the favorable effects of high temperature and the long day during the grow periods, which simulte the plant metabolism and increase the vegetative growth of the plant and consequently more metabolites are stored in corm. Similar conclusions were obtained by Bradbury and Holloway (1988), Metwally (1996), Chan *et al.* (1999), Wei *et al.* (1999), Hsiu (2000), Keates *et al.* (2001), Susan *et al.* (2003) and Machado (2005).

The interactions in Tables (4, 5 and 6) between sprouting methods and planting dates had also significant effect on the corm contents of dry matter, starch and protein. Whereas phosphorus, potassium, calcium, magnesium and total oxalate contents were not significantly affected in the two seasons. Data indicated that planting taro seeds on (15th April) with pre-sprouted seeds gave a favour quality of taro corms.

Table 5: Effect of sprouting methods and planting dates on chemical contents of corm during 2003 and 2004 seasons at harvest time.

Characters / Treatments		N (%)		P (%)		K (%)	
		2003	2004	2003	2004	2003	2004
Pre-sprouted seeds (New method)		1.225	1.219	0.782	0.796	1.457	1.547
Unsprouted seeds (conven. method)		1.191	1.189	0.781	0.795	1.461	1.543
F. Test		NS	NS	NS	NS	NS	NS
Dates							
15/2		1.157	1.161	0.776	0.795	1.447	1.528
1/3		1.170	1.178	0.780	0.792	1.458	1.538
15/3		1.198	1.201	0.782	0.794	1.453	1.547
1 / 4		1.246	1.232	0.782	0.795	1.470	1.558
15/4		1.270	1.250	0.788	0.801	1.467	1.553
F. Test		*	*	NS	NS	NS	NS
LSD at 0.05		0.47	0.36	--	--	--	--
Interaction							
Pre-sprouted seeds	15/2	1.176	1.180	0.777	0.796	1.447	1.530
	1/3	1.187	1.196	0.781	0.793	1.450	1.540
	15/3	1.210	1.212	0.782	0.794	1.453	1.547
	1 / 4	1.272	1.240	0.783	0.795	1.470	1.560
	15/4	1.280	1.270	0.788	0.802	1.467	1.557
Un-sprouted seeds	15/2	1.138	1.142	0.776	0.795	1.447	1.527
	1/3	1.153	1.160	0.780	0.792	1.467	1.537
	15/3	1.186	1.190	0.782	0.793	1.453	1.547
	1 / 4	1.220	1.224	0.781	0.794	1.470	1.557
	15/4	1.260	1.230	0.787	0.800	1.467	1.550
F. Test		*	*	NS	NS	NS	NS
LSD at 0.05		0.27	0.22	--	--	--	--

Table 6: Effect of sprouting methods and planting dates on chemical contents of corm during 2003 and 2004 seasons at harvest time.

Characters / Treatments		Ca (%)		Mg (%)		Oxalate (%)	
		2003	2004	2003	2004	2003	2004
Pre-sprouted seeds (New method)		0.396	0.345	0.209	0.233	1.825	1.884
Un-sprouted seeds (Conven. method)		0.391	0.352	0.204	0.22	1.827	1.884
F. Test		NS	NS	NS	NS	NS	NS
Dates							
15/2		0.358	0.287	0.155	0.163	1.805	1.862
1/3		0.36	0.332	0.183	0.193	1.805	1.858
15/3		0.373	0.352	0.203	0.227	1.825	1.865
1 / 4		0.408	0.37	0.225	0.248	1.843	1.907
15/4		0.468	0.403	0.267	0.3	1.853	1.928
F. Test		**	**	**	**	**	**
LSD at 0.05		0.030	0.027	0.020	0.023	0.020	0.022
Interaction							
Pre-sprouted seeds	15/2	0.367	0.29	0.157	0.17	1.807	1.857
	1/3	0.38	0.323	0.193	0.21	1.803	1.863
	15/3	0.373	0.35	0.203	0.233	1.827	1.867
	1 / 4	0.397	0.36	0.227	0.257	1.84	1.907
	15/4	0.463	0.403	0.267	0.293	1.85	1.927
Un-spouted seeds	15/2	0.35	0.283	0.153	0.157	1.803	1.867
	1/3	0.34	0.34	0.173	0.177	1.807	1.853
	15/3	0.373	0.353	0.203	0.22	1.823	1.863
	1 / 4	0.42	0.38	0.223	0.24	1.847	1.907
	15/4	0.473	0.403	0.267	0.307	1.857	1.93
F. Test		NS	NS	NS	NS	NS	NS
LSD at 0.05		--	--	--	--	--	--

22Conclusion

It could be concluded that taro plant can be planted succssefully in the north region of Delta until the 15th of April, but the most favourable planting date was 15th March to get the highest yield.

Moreover, using pre-sprouted taro seeds (new method) in cultivation might decrease the quantity of seeds required per feddan,as well as decrease the percentage of absent hills in the field as compared with the un-sprouted seeds which is used in the conventional method, in addition to an increment in total yield /feddan by 18.05 – 20.17% .

Finally, this study proved the possibility of growing taro plant in the northern part of Delta and consequently will prolong taro production in Egypt.

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دراسة تأثير عملية تنبيت التقاوى ومواعيد الزراعة على نمو ومحصول نبات القلقاس فى منطقة شمال الدلتا

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أجريت تجربتان حقليتان فى موسمي نمو ناجحين ٢٠٠٣ و٢٠٠٤ على نبات القلقاس (صنف محلى) بالزهراء – المنصورة- محافظة الدقهلية – مصر. (كمثال جيد لمنطقة شمال الدلتا).الهدف الرئيسى لهذا البحث هو دراسة تأثير استخدام تقاوى قلقاس تم تنبيتها قبل الزراعة كطريقة جديدة بدلاً من الزراعة بتقاوى لم يجر لها تنبيت وهى الطريقة التقليدية وكذلك تأثير ميعاد الزراعة على النمو الخضرى والمحصول ومكوناتهم لنبات القلقاس.

أوضحت النتائج أن نسبة الإنبات، طول النبات، المساحة الورقية، الوزن الطازج والجاف للأجزاء الهوائية للنبات، وزن الكورمات/نبات، متوسط وزن الكورمة والمحصول الكلى للفدان قد زادت زيادة معنوية عند استخدام تقاوى تم إنباتها قبل الزراعة مقارنة بتلك التى لم يجر لها انبات قبل الزراعة و أدى استخدام تقاوى تم انباتها قبل الزراعه الى زيادة المحصول الكلى للفدان بمعدل (١٨،٠٥-٢٠،١٧%) مقارنة بالطريقه التقليديه خلال موسمى الدراسة على الترتيب . من ناحية اخرى لم يتأثر محتوى الدرنات من المادة الجافة، النشا، البروتين، النيتروجين، الفوسفور، البوتاسيوم، الكالسيوم، الماغنسيوم والأوكسالات الكلية بعملية التنبيت.

فيما يتعلق بمواعيد الزراعة، اوضحت النتائج ان الزراعة فى (١٥ مارس)اعطت زيادة معنوية فى قياسات النمو الخضرى والمحصول الكلى للفدان، بينما أعطت الزراعة فى (١٥ أبريل) زيادة فى نسبة وفى مكونات الكورمة من المادة الجافة، النشا، البروتين، النيتروجين، الكالسيوم، الماغنسيوم والأوكسالات الكلية. اعطت الزراعة فى الأول من ابريل زيادة معنوية فى وزن الكورمات/نبات ومتوسط وزن الكورمة . أوضح التفاعل بين طريقتى التنبيت لتقاوى البقلقاس ومواعيد الزراعة أن استخدام تقاوى تم إنباتها قبل الزراعة فى ١٥ مارس قد أعطت زيادة فى قياسات النمو الخضرى والمحصول الكلى تحت ظروف منطقة شمال الدلتا.

أخيرا ، أوضحت التجربة أن نجاح زراعة نبات القلقاس من خلال مواعيد زراعة مختلفة فى هذه المنطقة قد يكون مؤشرا جيدا لاطالة موسم إنتاج القلقاس فى المستقبل القريب فى مصر.